

theory and thus do not serve to establish it. (The simplicity and directness of Pellat's theoretical investigation seem noteworthy when compared with the discussions of Gouy and of Larmor;¹ in each of the latter some of the apparent forces have to be explained away, and they appear to contradict each other. It may be that in such discussions too much importance is at present assigned to Maxwell's stress-system in the absence of more definite knowledge concerning the transmission of force between æther and matter, if the use of such a phrase is permissible.)

Prof. Duhem points out that Maxwell, in obtaining his first estimate of the velocity with which electromagnetic waves are propagated,² confounds Lamé's coefficient of rigidity with one of his own, which is really double the former, and that on correcting this mistake a velocity is obtained which exceeds that of light in the ratio of $\sqrt{2}$ to 1. This work of Maxwell's is, however, generally regarded as containing only the germ of a theory of light and as indicating that the two velocities concerned are of the same order of magnitude.

The author concludes by lauding the electrodynamic theory of Helmholtz, which he regards as satisfactorily reconciling the electromagnetic theory of light with the ancient theories of electricity and magnetism.

It is surprising to find no reference whatever to Larmor or to H. A. Lorentz in the historical sketch of this branch of the subject.

Although some of the mistakes pointed out by Prof. Duhem are real and important, the view taken throughout, as will be gathered from the above, appears a very narrow one.

W. MCF. ORR.

OUR BOOK SHELF.

Clinical Pathology and Practical Morbid Histology. By J. Strangeways Pigg, M.A. Second edition. Pp. 107; 5 plates and 6 figures. (London: Strangeways and Sons, 1901.) Price 5s.

THIS is a small interleaved handbook for use in the laboratory, dealing with the different methods employed in examining blood and other normal and pathological fluids and morbid tissues.

The descriptions of the various methods referred to are brief and concise, and the steps of each operation are tabulated in exact sequence, with perhaps the exception of 24, D, where steps 6 and 5 should obviously be transposed. Objection may be raised to such an arrangement as being too dogmatic and allowing no scope for individual ingenuity, but, on the other hand, those who have to deal with large classes of students, to whom the book is chiefly directed, will agree that some such method is absolutely necessary if one would instil the principles underlying good technique.

The general "get-up" of the book is good; there are very few printers' errors save an occasional missing letter at the end of a line, or the interpolation of a letter from another fount of type. "The illustrations," we are told, "are diagrams only," a description obviously applying to those of apparatus and urinary sediments—which latter, by the way, would have been more useful had they been bound up in somewhat closer proximity to the letter-press relating to them—but hardly fair to the two coloured plates of blood-cells. These are, in spite of their accuracy, beautiful and artistic, and reflect nothing but credit on artist and lithographer.

¹ *Phil. Trans.* 1897, A. p. 248.

² "Scientific Papers," vol. i. p. 500.

The methods set out in the text are, for the most part, well chosen and well described; those dealing with morbid histology are, however, by far the most successful. In blood work, we notice, the author recommends Cabot's "two-cover-slip" method of spreading films—a method which in the hands of experts yields, perhaps, 10 per cent. of stainable specimens—and quite ignores the simpler method introduced by Manson, in which gutta-percha tissue or a piece of cigarette paper is employed.

We notice, too, in the preparation of cover-glass films from pus or sputum, that extremely dirty and slovenly method of pressing out a small portion of the material between two cover-glasses and then sliding them apart, is given as the usual method. We hope that this is not the universal practice in Cambridge laboratories.

The sections dealing with bacteriological methods and urinalysis are certainly disappointing—in the latter the methods are few in number and, in our opinion, not always happily chosen, whilst fuller indications of the fallacies which attend some of the tests would have enhanced their value. In that portion dealing with bacteriological investigations, many of the methods might find favour in the clinical laboratory, but would certainly be *taboo* in the well-regulated bacteriological laboratory. We notice, too, that the author invariably uses *Carbol-gentian-violet* in staining by the method he terms Gram's; it is true the actual stain is easier to prepare, but its results are decidedly inferior to those yielded by the *Anilin-gentian-violet* originally described by Gram.

As we have before mentioned, the book is intended for the medical student, and as such is of distinct value, a fact sufficiently evidenced by the success with which the first edition has met

The Balancing of Engines. By W. E. Dalby, M.A., B.Sc. Pp. xi + 283. (London: Edward Arnold, 1902.) Price 10s. 6d. net.

THIS work is of a character which can be studied with interest. It deals with a subject of great importance to mechanical engineers, and one which is coming more and more to the front in the design of high-speed engines and machinery.

Prof. Dalby is the author of several papers dealing with this important subject, read before the Institutions of Naval Architects and Mechanical Engineers; these papers are largely drawn upon in the present volume.

"The main object of the book is to develop a semi-graphical method which may be consistently used to attack problems connected with the balancing of the inertia forces arising from the relative motion of the parts of an engine or machine." This we learn from the preface, and, what is more, it requires nothing but the knowledge of the four rules of arithmetic and good draughtsmanship to apply satisfactorily the methods so well described.

The balancing of the working part of locomotives has always been treated from different points of view, and the practice of a particular drawing office largely governed the result; in fact, not many years ago an eminent locomotive engineer looked upon the balancing of his locomotives as an unnecessary addition to their weight.

Chapter iv. deals with this very important subject in a clear, concise and practical manner, and even only for this one chapter all interested in locomotive design should possess this volume. The author advises that those interested in locomotive work should begin chapter iv., after working the examples of arts. 48 and 49, progress being tested by working the exercises at the end of the book.

The treatment is simple, several types of Lancashire and Yorkshire Railway Company's locomotives being taken as examples, and little thought will be necessary to carefully follow the threads of the argument. The experimental apparatus described to illustrate the

various problems of locomotive balancing is very interesting, appearing to thoroughly fulfil the conditions.

Prof. Dalby has produced a book useful alike to the mechanical engineer and the student. N. J. L.

Guide to Italy. Pp. civ + 352 + 4. Price 10s. net.

Guide to the Western Mediterranean. Pp. xxvi + 238. (London: Macmillan and Co., Ltd., 1901.) Price 9s. net.

IN adding one more series of guide-books to those already in existence, the publishers have struck out in a somewhat new line by making conciseness their most important feature. The overworked professional man, who has little time to read up lengthy descriptions, will here find, condensed into a smaller compass than has previously been done, the most important points to be looked out for on his proposed journey. The authors of these books have been remarkably successful in condensing so large an amount of information into them.

The "Western Mediterranean" is divided into sections dealing respectively with Lisbon, Andalusia, Morocco, Algeria, Malta, Naples, the Riviera, the Balearics, and other ports and districts of interest. In "Italy" a different and novel order has been adopted. The book opens with articles on Italian life, art and architecture by "O. B." and other well-known writers. Next comes a description of routes *only*, without lengthy descriptions of towns; lastly, the towns of Italy are described in alphabetical order. The advantages of this method may not, perhaps, impress the reader at a first glance, but as soon as he is accustomed to the new order of things he will become converted to the belief that the system effects a considerable saving of time and trouble and is most convenient. Hotels are enumerated in a list by themselves; in a future edition the authors might with advantage make an effort to give fuller information under this head, especially in reference to tariffs. There are also a few minor points on which opinions may differ. Most Italians know an "Inglese" fast enough and do not take every foreigner for a Frenchman (p. xii.); in the vocabulary (p. xvi.), "entrare" is a more familiar equivalent for "come in" than "avanti"; and if the authors of "Italy" are *really* right as to the situation of Virgil's tomb (p. 147), Neapolitan guides and cab-drivers have been wrong for many years. The maps are excellent.

Outlines of Electrochemistry. By H. C. Jones. Pp. vi + 106. (New York: The Electrical Review Publishing Co., 1901.)

THIS is an exceedingly interesting book. The title is, perhaps, a little misleading. To our mind it would be better to call it "Physical Foundations of Electrochemistry," or some similar title. There is an inclination among writers of electrochemistry to treat the subject entirely from the physical standpoint, hence many books on the subject lack breadth of treatment. The present book, as the author explains in the preface, is a republication of papers which originally appeared in the *Electrical Review* (New York).

Chapter i. deals with osmotic pressure in a very clear and lucid manner. Chapter iv., on the "newer theories of electrolysis," is very ably written, and here Mr. Jones, in explaining the theory of the electrolysis of water containing acids, alkalis or salts in solution, adopts the theory of Le Blanc, which looks upon the electrolysis of water as being a *primary* and not a secondary reaction. Most writers explain the electrolysis of water as being of a secondary nature, due to the presence of the acid or base in solution. According to Le Blanc, it is entirely a question of the decomposition value of the water, and of the salts, acids or bases in solution. In an aqueous solution of an acid, for example, it is simply a question whether the ions of the acid or those of the water will the

more readily give up their electrical charges, it being assumed that pure water is slightly ionised.

Chapter vi., which is divided into two parts, deals with the "conductivity of solutions," and a very interesting lecture experiment, due to Noyes and Blanchard, for showing the different conducting powers of various electrolytes, is described. A good deal of attention is devoted to the dissociating power of different solvents, especial stress being laid upon the dissociation of electrolytes in alcohol. Mr. Jones does not, however, refer to the fact that certain inorganic salts are considerably ionised when dissolved in pyridine. In this connection it is interesting to notice that quite recently Kahlenburg has succeeded in depositing lithium in the metallic form, from the solution of its chloride in pyridine.

Mr. Jones is to be congratulated upon having presented us with a very readable and scientifically written account of the foundations of electrochemistry. We notice that the author is engaged upon a work on physical chemistry, the production of which we await with interest.

F. M. P.

Outlines of Botany. By R. G. Leavitt. Pp. 272. (New York: American Book Company.)

THIS book has been compiled for use in high schools and is based on Asa Gray's "Lessons in Botany," an abridgment of his well-known standard work on plant morphology. The author points out that he is not in agreement with the strong ecological bias developed in so many recent American text-books, and that he has endeavoured rather to develop the study of structure and form, and also to emphasise the physiological factors which control plant life. This view will be endorsed by many botanists.

The method adopted is to suggest a series of practical studies, each being followed by an elaborated theoretical discussion. The principle involved of setting the student to learn by direct observation depends firstly on the student and secondly on appropriate treatment of the subject. For advanced students such a course might be admirable. But for students at high schools there is neither the requisite time nor training required for such investigations; for these introductory lectures are absolutely necessary. Then again, as regards his treatment of the subject, one must entirely differ from the author. The first chapter, dealing with seeds and seedlings, will illustrate the objections to be raised. Beginning with the gross features of the castor bean, lupin and maize, the author next proposes a series of physiological exercises—*e.g.* the nature and location of food reserves; absorption of oxygen, production of carbon dioxide and heat evolved in germination; geotropism and development of chlorophyll. He then returns to morphology to give a brief summary of special morphological features. It will be observed that on the one hand the training to be gained by a well-balanced and varied series of anatomical exercises seems to have been overlooked, for the castor bean does not offer a favourable object for a first investigation, and at least eight or ten seeds should be examined. On the other hand, the physiology is too varied. What teacher with practical experience does not know the many difficulties and pitfalls which attend even simple experiments? What success may be expected for a young and inexperienced investigator who attempts these broadly-extending exercises, with the help of descriptions which are often extremely vague? Throughout the chapters dealing with the flowering plant there is the same paucity of development and want of judgment in choosing anatomical exercises. The book contains a cryptogamic course which is somewhat superficial, and closes with two unsatisfactory chapters on anatomy and physiology.